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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/607,860	06/27/2003	Ming Jia	7000-267	7133
27820	7590	10/16/2006	EXAMINER	
WITHROW & TERRANOVA, P.L.L.C.			BURD, KEVIN MICHAEL	
P.O. BOX 1287			ART UNIT	PAPER NUMBER
CARY, NC 27512			2611	

DATE MAILED: 10/16/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/607,860

Applicant(s)

JIA ET AL.

Examiner

Kevin M. Burd

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 June 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-36 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-36 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 27 June 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____.

Drawings

1. Figures 1-4, 8A, 8B and 9 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Figures 1-4, 8A, 8B and 9 are shown in Tong et al (US 2004/0066866) application number 10/263,268 filed 10/2/2002. Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

2. Claims 1-36 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. Claims 1-36 do not contain a tangible result and therefore, are non-statutory.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

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A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1-4, 7-13, 16-19, 22-28 and 31-35 are rejected under 35 U.S.C. 102(b) as being anticipated by Hassan et al (US 5,968,198).

Regarding claims 1-4, 7, 8, 16-19, 22, 23 and 31-35, Hassan discloses a method using the decoders shown in figure 4. Hassan provides a codebook comprising symbol vectors corresponding to potential combination of transmitted symbols (column 1, lines 38-47). A codeword is selected that is closest to the received vector (column 11, lines 54-58). The distance between them is the Euclidean distance (column 4, lines 19-21). This output is often referred to as the hard information output (column 1, lines 38-48). Soft information output have historically been generated by the decoder in conjunction with the selection of the closest codeword and it's associated hard information output (column 1, lines 65-67). The reliability information comprising the soft information output is calculated for each individual symbol (bit) within the hard information output (column 2, lines 1-3). The closest Euclidean distance between the received data vector and a hypothetical codeword having a logic value of one or zero in one of the information bit positions. When the value is greater than zero, this means that a zero is more likely for the corresponding hard information bit (column 5, lines 30-47). The soft information is determined using a log likelihood ratio (column 7, lines 11-30).

Regarding claims 9-13 and 24-28. Hassan discloses decoding the received signal received from a plurality of transmit antennas. Initial solutions are determined by this decoding. A decoding space is determined from these solutions comprising a

limited area wherein the distances are determined. The limited area and the decoding space are the constellation lattice.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 5, 6, 20, 21 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hassan et al (US 5,968,198) in view of "Turbo-coded Modulation for Systems with Transmit and Receive Antenna Diversity Over Block Fading Channels: System Model, Decoding Approaches, and practical Considerations" Stefanov et al, IEEE Journals on Selected Areas in Communications, IEEE INC. New York, vol. 19, no. 5, May 2001 (pages 958-968).

Regarding claims 5, 6, 20, 21 and 36, Hassan discloses the method stated above but does not disclose how the Euclidean distances are calculated. Stefanov discloses using turbo codes for systems with antenna diversity in pages 960-962. It would have been obvious for one of ordinary skill in the art at the time of the invention to utilize the turbo-coding described in Stefanov in the method of Hassan. The turbo coding disclosed observes significant performance gains over the appropriately interleaved space-time trellis codes (abstract).

5. Claims 14, 15, 29 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hassan et al (US 5,968,198) in view of Naguib et al (US 6,693,982).

Regarding claims 14 and 29, Hassan discloses the method stated above but does not disclose a zero-forcing technique is used to carry out the space-time decoding. Naguib discloses zero-forcing interference cancellation techniques are well known in the art and can be interchanged with a MMSE technique. It would have been obvious for one of ordinary skill in the art at the time of the invention to utilize the zero-forcing technique of Naguib in the method of Hassan. Zero-forcing provides accurate interference cancellation required to remove noise and allows data to be recovered correctly (column 10, lines 5-61).

Regarding claims 15 and 30, Hassan discloses the method stated above but does not disclose a minimum mean square error decoding (MMSE) technique is used to carry out the space-time decoding. Naguib discloses using the MMSE to cancel interference and discloses in certain cases the MMSE approach will have a better performance as compared to the zero-forcing case (column 10, lines 5-61). For this reason, it would have been obvious for one of ordinary skill in the art at the time of the invention to combine the MMSE technique of Naguib into the method of Hassan.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Terry et al (US 6,654,928) discloses a method of decoding by determining Euclidean distances and calculating hard and soft information from the

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comparisons to predetermined codewords (column 7, lines 12-52). Tong et al (US 2004/0066866) discloses the prior art decoding as shown in figures 1-4 as well as limiting area in a constellation lattice to decode the received symbols (figures 6A, 6B and 7).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kevin M. Burd whose telephone number is (571) 272-3008. The examiner can normally be reached on Monday - Friday 9 am - 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jay Patel can be reached on (571) 272-2988. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Kevin M. Burd
10/12/2006


KEVIN BURD
PRIMARY EXAMINER